



Spectral Gamma-Ray Borehole Log Data Report

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Borehole

30-10-02

Log Event A

Borehole Information

Farm : <u>C</u>	Tank : <u>C-110</u>	Site Number : <u>299-E27-102</u>
N-Coord : <u>42,945</u>	W-Coord : <u>48,494</u>	TOC Elevation : <u>648.00</u>
Water Level, ft :	Date Drilled : <u>9/30/1974</u>	

Casing Record

Type : <u>Steel-welded</u>	Thickness : <u>0.280</u>	ID, in. : <u>6</u>
Top Depth, ft. : <u>0</u>	Bottom Depth, ft. : <u>100</u>	

Borehole Notes:

This borehole was drilled in September 1974 and completed to a depth of 100 ft with 6-in.-diameter casing. A driller's log for this borehole was not available; therefore, information from Chamness and Merz (1993) was used to prepare this report. No information indicated that the borehole was grouted or that the casing was perforated; therefore, it is assumed that the borehole was not grouted or perforated. The casing thickness is assumed to be 0.280 in., on the basis of the published thickness for schedule-40, 6-in. casing.

The top of the casing is the zero reference for the log. The casing lip is approximately even with the ground surface.

Equipment Information

Logging System : <u>2</u>	Detector Type : <u>HPGe</u>	Detector Efficiency: <u>35.0 %</u>
Calibration Date : <u>10/1996</u>	Calibration Reference : <u>GJO-HAN-13</u>	Logging Procedure : <u>P-GJPO-1783</u>

Log Run Information

Log Run Number : <u>1</u>	Log Run Date : <u>02/27/1997</u>	Logging Engineer: <u>Bob Spatz</u>
Start Depth, ft.: <u>99.0</u>	Counting Time, sec.: <u>100</u>	L/R : <u>L</u> Shield : <u>N</u>
Finish Depth, ft. : <u>38.0</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>
Log Run Number : <u>2</u>	Log Run Date : <u>02/28/1997</u>	Logging Engineer: <u>Bob Spatz</u>
Start Depth, ft.: <u>39.0</u>	Counting Time, sec.: <u>100</u>	L/R : <u>L</u> Shield : <u>N</u>
Finish Depth, ft. : <u>0.0</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>
Log Run Number : <u>3</u>	Log Run Date : <u>02/28/1997</u>	Logging Engineer: <u>Bob Spatz</u>
Start Depth, ft.: <u>40.0</u>	Counting Time, sec.: <u>100</u>	L/R : <u>L</u> Shield : <u>N</u>
Finish Depth, ft. : <u>20.0</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>



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Analysis Information

Analyst : H.D. Mac Lean

Data Processing Reference : MAC-VZCP 1.7.9

Analysis Date : 09/05/1997

Analysis Notes :

The SGLS log of this borehole was completed in three logging runs. Two logging runs were required to complete the log of the borehole. A third logging run repeated a segment of the borehole as an additional quality assurance check and to observe the repeatability of the radionuclide concentration measurements. A centralizer was used during all runs.

The pre- and post-survey field verification spectra for all logging runs met the acceptance criteria established for peak shape and system efficiency. The energy and peak-shape calibration that best matched the logging run data were used to establish the channel-to-energy parameters used in processing the spectra acquired during the logging runs. There was negligible gain drift during the logging runs, and it was not necessary to adjust the established channel-to-energy parameters to maintain proper peak identification.

Casing correction factors for a 0.280-in.-thick casing were applied during the analysis.

Cs-137 was the only man-made radionuclide detected in this borehole. Cs-137 contamination was detected continuously from the ground surface to a depth of 30.5 ft, at 32.5 ft, continuously from 34 to 37.5 ft, and from 44 to 63.5 ft. The measured Cs-137 concentrations ranged from about 0.2 pCi/g (just above the MDL) to about 10 pCi/g. The highest measured subsurface concentration was about 16.5 pCi/g at a depth of 47 ft. Zones of generally higher contamination levels were detected at depths of approximately 2, 12.5, 25, 28, 36.5, and 47 ft. The measured Cs-137 concentration at the ground surface was 20.2 pCi/g.

A zone of slightly elevated K-40 concentrations occurs between depths of 38 and 40 ft. The logs of the naturally occurring radionuclides show an increase in K-40 concentrations from a background of about 13 pCi/g above a depth of 40 ft to about 16 pCi/g from 49 to 60 ft and to about 17 pCi/g below the 60-ft depth. The U-238 concentrations also increase below a depth of about 60 ft.

An analysis of the shape factors associated with applicable segments of the spectra was performed. The shape factors provide insights into the distribution of the Cs-137 contamination and into the nature of zones of elevated total count gamma-ray activity not attributable to gamma-emitting radionuclides.

Details concerning the interpretation of data for this borehole are presented in the Tank Summary Data Reports for tanks C-110 and C-111.

Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations.

Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.



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A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

A separate plot is included for the repeated segment of the log. The plot shows the concentrations of the Cs-137 and the naturally occurring radionuclides measured by the original and repeated logging runs. The uncertainty of each measurement is indicated on the plot. The concentrations measured by the original and repeated logging runs are generally within the two sigma (95 percent) confidence level of the measurements.

A plot of representative historical gross gamma-ray logs from 1975 to 1983 is included.

Plots of the spectrum shape factors are included. The plots are used as an interpretive tool to help determine the radial distribution of man-made contaminants around the borehole.